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14. ABSTRACT UNITE, supported by the U.S. Army Research Office for over twenty-five years, is an intensive, summer engineering experience for minority students. The 2010 program was held at nine locations across the U.S. including: University of Detroit Mercy, FIU, NJIT, TSU, Morgan State, University of Delaware, New Mexico MESA, Savannah State University and Xavier University Louisiana. The following report includes site specific information as well as data collected across the program as a whole.					
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## **Report Title**

UNITE 2010 Final Report

### **ABSTRACT**

UNITE, supported by the U.S. Army Research Office for over twenty-five years, is an intensive, summer engineering experience for minority students. The 2010 program was held at nine locations across the U.S. including: University of Detroit Mercy, FIU, NJIT, TSU, Morgan State, University of Delaware, New Mexico MESA, Savannah State University and Xavier University Louisiana. The following report includes site specific information as well as data collected across the program as a whole.



# 2010 UNITE FINAL REPORT

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## **Program Description**

UNITE, supported by the U.S. Army Research Office (ARO) for over twenty-five years, is an intensive introduction to engineering for minority students. UNITE offers students the opportunity to see how engineering touches almost every aspect of our lives through rigorous academic classes, hands-on activities and team-building exercises. Modeled to parallel a first year engineering student's coursework at a university, UNITE consists of four to six weeks of classes and other educational activities that serve as a brief introduction to college life. Participants are diverse in respect to age, gender, race, geographic location and school affiliation, and it is this diversity that allows for learning to continue even after classes are completed, as students are exposed to different cultures and are able to forge new friendships.

The UNITE program affords thousands of young people, who may not have otherwise had the opportunity, to become exposed to engineering and technology both as fields of study and a career choice, while also demonstrating how math and science are applied in everyday life.

The 2010 program was held at nine locations:

**University of Detroit- Mercy**  
**Florida International University**  
**New Jersey Institute of Technology**  
**Texas Southern University**  
**Morgan State University**  
**University of Delaware**  
**New Mexico MESA**  
**Savannah State University**  
**Xavier University-Louisiana**

JETS coordinates and administers the UNITE program, and uses its technical resources and solid expertise in educational program management to provide a challenging and fun learning experience that effectively meets the needs of the students. The JETS partnership with the Army Research Office not only affords students an introduction to engineering, but also helps students build a more positive academic attitude, self confidence and a willingness to learn. While each UNITE site is different, each program is required to meet established program guidelines which foster this creative learning environment and positive outlook while also streamlining the curriculum. This allows for a general consistency in student experience and outcome, while still affording sites some flexibility in designing the details of their program to meet the unique needs of their own students.

As the JETS UNITE program evolves, it continues to successfully meet its goal of introducing high school students to the wonderful world of engineering and all of its possibilities.

### **New this year...**

This year we added a ninth UNITE site, Xavier University-Louisiana to our well established existing sites. We were pleased that the new addition was able to reach

out to the community of New Orleans who were unfortunately unable to participate last year.

## **Program Overviews and Successes**

### New Jersey Institute of Technology

The UNITE program at NJIT is coordinated in conjunction with the FEMME8 and FEMME Academy programs, challenging rising ninth and tenth grade females to improve their math and science backgrounds, while encouraging them to pursue STEM careers, with an ultimate goal of increasing the number of women in these fields.

### New Mexico–MESA

The UNITE program at NM-MESA was an eight-week intensive program that has been in existence for nearly 20 years, challenging students to enhance their academic skills through advanced course work, providing a summer experience opportunity to students with limited resources. All classes participated in a Career Panel at the University of New Mexico, a visit to Kirtland AFB, in addition to several hands-on learning experiences.

### Florida International University

As one of the largest UNITE programs, FIU relies on its strong partnership with the university's ROTC program, in addition to its long standing ties with the Miami-Dade Public School District. The program selected top students, those of which had a cumulative grade point average of 3.0. FIU's classroom methodology incorporating problem solving and teamwork helps to teach students how to think critically and analyze a situation, giving them the ability to foresee and prevent future challenges. The emphasis on teamwork has built a community spirit amongst students and has allowed them to appreciate the collaborative nature of assignments and how often in the real-world projects are conducted using a variety of resources and a group of people.

### University of Detroit–Mercy

A continuing cornerstone of the UNITE program's success at UD–Mercy was that classes very closely mimicked the experience college freshman have in their classes. Persuasive Speaking, Computer Applications, Trigonometry, Physics, and College Writing were taught by University faculty and were structured after a real course at the University, providing students the opportunity to earn class credits. These courses are enriched by the addition of hands-on activities and projects that emphasize teamwork, a common theme among UNITE programs and critical to success in future education and career endeavors. Additional specialized faculty taught students Matlab and Catia, software and programming students will later encounter again in a collegiate engineering curriculum. Lastly, students are given unlimited and complimentary access to the University's tutoring services throughout the school year to ensure students maintain their studies and keep on track to a bright future.

### University of Delaware

Over the years, the UD program has earned an outstanding reputation within the state of Delaware, and continues to attract a diverse student body, fulfilling their

mission of exposing the greatest amount of underrepresented populations as possible. In 2010, over 60% of the students were female and over 80% were African American. While the program certainly holds their primary focus on engineering, students are also exposed to a variety of academic programs and an experience of residential life so that students are offered a true taste of what to expect as successful college student in the future.

#### Texas Southern University

With a well organized, structured curriculum provided by the Department of Engineering Technologies of Texas Southern University, the program was able to serve nearly fifty students in the surrounding area, and 95% being African American. It was geared towards ensuring that participants have the proficiency in mathematics, science and computers required for high school completion and college entry. The program also incorporated classroom tutoring, hands-on activities, field trips and career counseling sessions.

#### Morgan State University

Morgan State along with National Aeronautics and Space Administration (NASA), offered an initiative to expose more students to the exciting field of robotics. The program provided theoretical and hands on training in the field. In addition, computer programming, oral and written communication skills, and professional/personal development were offered to the students by skilled Morgan State University Alumni and Corporate/Government agencies.

#### Savannah State University

The UNITE program in conjunction with the pre-established Upward Bound program , achieved their goal of increasing student interest in and inclination to pursue science, math, technology and engineering. Through hands-on activities, keeping students engaged during the entirety of class, team building and introducing them to software simulation, the program ran smoothly. In addition, the residential aspect of the program provided a sense of community, allowing students to develop skills that will help them work and communicate effectively with others.

#### Xavier University-Louisiana

The new addition of our ninth site, Xavier University started their first year with much success of conquering their objective of attracting ethnic minority students and assisting them in the preparation for careers in engineering. Introducing nearly 50 students to the UNITE program, Xavier worked hard to improve the analytical reasoning and vocabulary skills of each participant. This program was a vital piece of the overall plan to promote STEM (Science, Technology, Engineering, and Math) education in the state of Louisiana. With the first year running smoothly, they have laid a solid groundwork for the upcoming years.

## **Unite Program Participation**

The total number of students impacted by UNITE this year was 435\*. This represents a decrease in participation of 16%. The average student population for a UNITE site is 48, with the high being New Mexico's nine participating sites at 72 students and the low being Morgan State with 18 students. Populations vary greatly due to a variety of factors including resource constraints, budget limitations, and overall student interest. However, the most tangible variable as seen within the



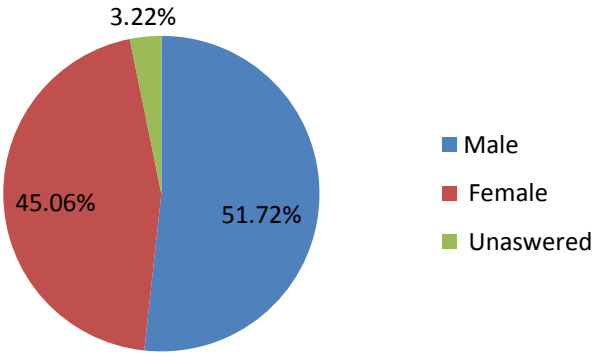
program reports is whether a program is residential or commuter, as residential programs usually cap around 30 students.

Program participation is a defining factor when evaluating the various sites, though it is not the only one. The quality and substance of the content and program overall also plays a major role in the evaluation process, as we need to ensure the programs meet their goals and those outlined by JETS and the Army Research Office as part of the UNITE grant funding. JETS through its evaluation process, may recommend that one or more sites be dropped and/or replaced, as each site is expected to continuously improve its programs and if possible, its participation numbers as well. At this time, we do not have any recommendations to drop any of the UNITE sites.

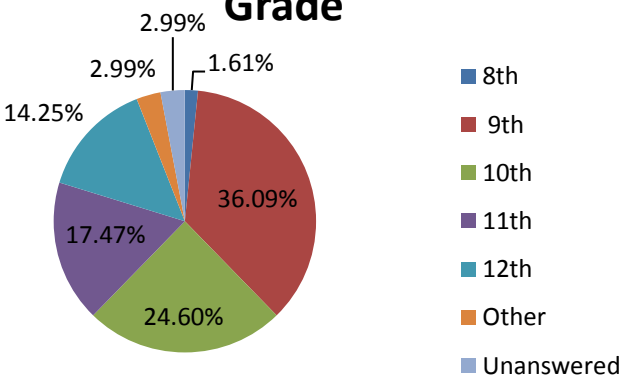
\*The total number of students was based on the number of students who answered the pre assessment survey which was conducted at the beginning of all UNITE programs. We considered them to be impacted from the program even though they may not have completed the programs entirety.

## **UNITE Program Statistical Information**

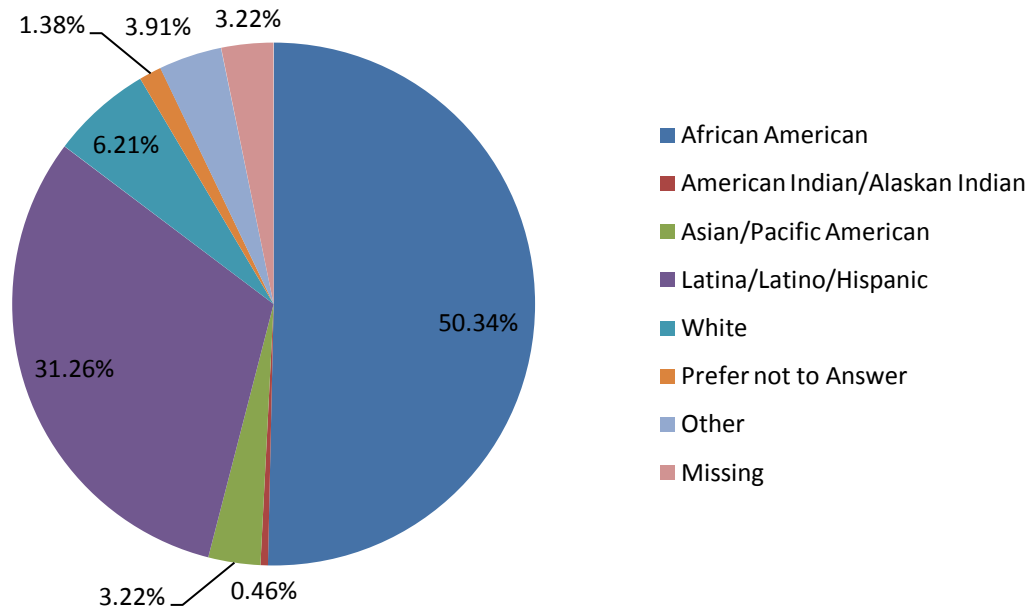
# Gender



# Grade



## Ethnicity



<b>U N I T E Program Statistics Through 2010 (Historical)</b>				
<b>PROGRAM SITES (Years in Program)</b>	<b># Students Impacted</b>	<b># Students Graduated HS</b>	<b># Students Graduated College</b>	<b># Students Graduated in Engineering</b>
University of Delaware (24)	1637	1613	n/a	n/a
University of Detroit-Mercy (31)	1312	1105	735	n/a
Florida International University (17)	2385	2120	1630	1330
New Mexico MESA (23)	2518	2468	1964	604
Texas Southern University (4)	160	70	0	0
Savannah State University (4)	75	15	0	0
Morgan State University (4)	80	21	0	0
New Jersey Institute of Technology (6)	282	60	0	0
Xavier University-Louisiana (1)	49	n/a	n/a	n/a
<b>TOTAL</b>	<b>8,498</b>	<b>6,225</b>	<b>4,402</b>	<b>2,344</b>

### 2010 Demographic Information: Individual Sites

	FIU	NM	De-troit	NJIT	Dela-ware	TSU	MSU	SSU	Xavier
# of Students	60	72	41	66	45	50	18	34	49
Male	46	30	21	31	16	26	8	17	30
Female	14	39	20	35	27	20	5	17	19
9th	2	16	35	66	0	16	3	0	19
10th	36	16	6	0	0	13	4	13	19
11th	11	22	0	0	16	7	4	5	11
12th	11	14	0	0	26	3	3	7	0
African American	9	1	36	9	38	44	10	34	38
American Indian	0	1	0	0	0	0	0	0	1
Asian	0	1	0	0	1	0	0	0	6
Caucasian	7	14	2	4	0	0	0	0	0
Hispanic	39	49	0	45	1	1	0	0	1
Other	5	4	3	0	3	1	1	0	0

**\*\*Unanswered demographic questions were not reflected in this chart.**

### 2010 Unite Program Budget

Budget Item	Total Amount Requested 2010 (based on 9 sites)	Actual Total
<b>1. Direct Support to Sites</b>		
a) Direct Payment to Sites	270,000	270,000
b) Guidance Assessment Process/Pre & Post students assessment	21,000	21,000
c) Instructional Material	18,000	18,000
d) Follow-up Guidance Materials/Students Tracking	6,000	6,500
<b>5. Program Support (JETS)</b>		

a) Staff Time	24,500	27,300
b) Travel	5,000	1,300
c) Admin	12,800	13,200
d) Audit	2,700	2,700
<b>Total</b>	<b>360,000</b>	<b>\$360,000</b>

## Conclusion

The 2010 UNITE program marked the end of the five year grant, plus three one-year extensions for a total of eight years of the current grant from the U.S. Army Research Office.

The national call to action for America to maintain its global competitiveness and economic edge has spawned multiple reports over the past 10 years placing an emphasis on the development and state of our nation's future workforce. Reports from the Bureau of Labor Statistics, Business Roundtable, and National Science Board—among others—have sited critical areas of concern for the advancement of the science and engineering (S&E) professions. Cyclical employment trends, government security needs, and the start of the "Baby Boom" retirement, are common factors relating to an expectation that S&E occupations will have a 70 percent greater growth rate over the next five years.

JETS maintains a vested interest in the pre-college engineering education community and is actively working to enhance its programs to attract today's students to the S&E occupations. JETS has current and effective programs in place that will help meet the demands of tomorrow and support America's youth with educational opportunities that inspire and prepare them to pursue S&E careers. Our history of success coordinating academic programs, developing career resources, and our experience with UNITE has prepared us to continue serving as the coordinator for such pre-college S&E initiatives. As we enter a new grant cycle, we look forward to continuing our relationship with the U.S. Army Research Office and fostering the young minds of today's students through UNITE.

Attachments:

JETS Background & Programs  
JETS Awards & Grants  
JETS Recent Highlights  
Assessment Summary

## JETS Background & Programs

JETS is a national non-profit education organization dedicated to promoting engineering and helping students discover their potential for the profession.

A solid framework of high school educators, corporations, professional organizations and universities incorporate JETS pre-college engineering programs in local communities throughout the United States. Employing a unique and innovative approach—Explore, Assess, Experience—thousands of diverse students are enticed to pursue engineering majors and careers each year.

To generate future engineering talent, JETS engages students in a variety of educational programs that increase awareness of what engineers do and show how math and science are used to make tangible differences in the world. Foundations for student impact are built upon providing career resources and experiences not often found in traditional learning environments; opening students' minds to their own career possibilities by removing social barriers and negative attitudes about engineering; and addressing major industry needs for a qualified, STEM-literate workforce.

### **Mission**

To increase student awareness of, aptitude for, and interest in engineering and technology-based professions.

### **Vision**

To be the preferred source of information and programs designed to stimulate middle and high school student interest in engineering and technology-based careers with a focus on diversity, including students historically underrepresented in science, technology, engineering and mathematics.

### **EXPLORE**

- **JETS News:** A free, monthly e-newsletter highlighting different engineering careers, engineer interviews and classroom activities.
- 
- [JETS.org/explore](http://JETS.org/explore): The online source for discovering engineering and helping students find their dream job.

### **ASSESS**

- **PathAssess™:** An online interest inventory giving students in grades 6-12 an inside look as to how their interests and skills can align with a majors in engineering and various occupations.

Through a series of demographic and interest-based questions, students will receive a personalized profile that gives them a glimpse into the types of engineering majors and careers they may wish to pursue.

## EXPERIENCE

- **TEAMS:** An annual high school competition challenging students to work collaboratively and apply their math and science knowledge in practical, creative ways to solve real everyday engineering challenges.
- **National Engineering Design Challenge (NEDC):** An annual design-build competition in which students, in grades 9-12, put their creativity and problem-solving skills to use and create a workplace assistive technology device for a person with a disability..
- **UNITE:** Prepares and motivates students historically underrepresented in engineering for success in college through summer academic programs held at universities across the country.
- **JETS.org/experience:** Provides on-line, hands-on activities, challenges, and lesson plans for student use



## **JETS Awards & Grants**

**During FY2010 (July 1 – June 30), JETS received awards and grants totaling over \$337,000 from:**

### **Sponsors**

Bechtel Group Foundation  
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### **Society Affiliates**

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### **University Affiliates**

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Arizona State University\*  
Arkansas State University  
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DeVry University-Kansas City\*  
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Norfolk State University\*  
North Carolina State University  
North Dakota State University\*  
Ohio Northern University\*  
Ohio University-Athens\*  
Penn State University-Fayette\*  
Penn State University-Wilkes Barre\*  
Pennsylvania State University  
Purdue University Calumet\*  
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Rowan University  
Saint Louis University  
Seattle University\*  
St. Louis C C at Florissant Valley\*  
Stanford University\*  
Stevens Institute of Technology  
The Citadel  
The George Washington University\*  
The University of Toledo\*  
Trine University\*  
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 University of Southern California\*  
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 University of Texas-San Antonio\*  
 University of Texas-Austin  
 University of Utah\*  
 University of Wyoming\*  
 Vanderbilt University\*  
 Villanova University  
 Virginia Military Institute\*  
 Wayne State College\*  
 West Virginia University\*  
 Widener University\*

*\*Indicates TEAMS Competition Host*

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CH2M Hill Power Business Group

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## **JETS Recent Highlights**

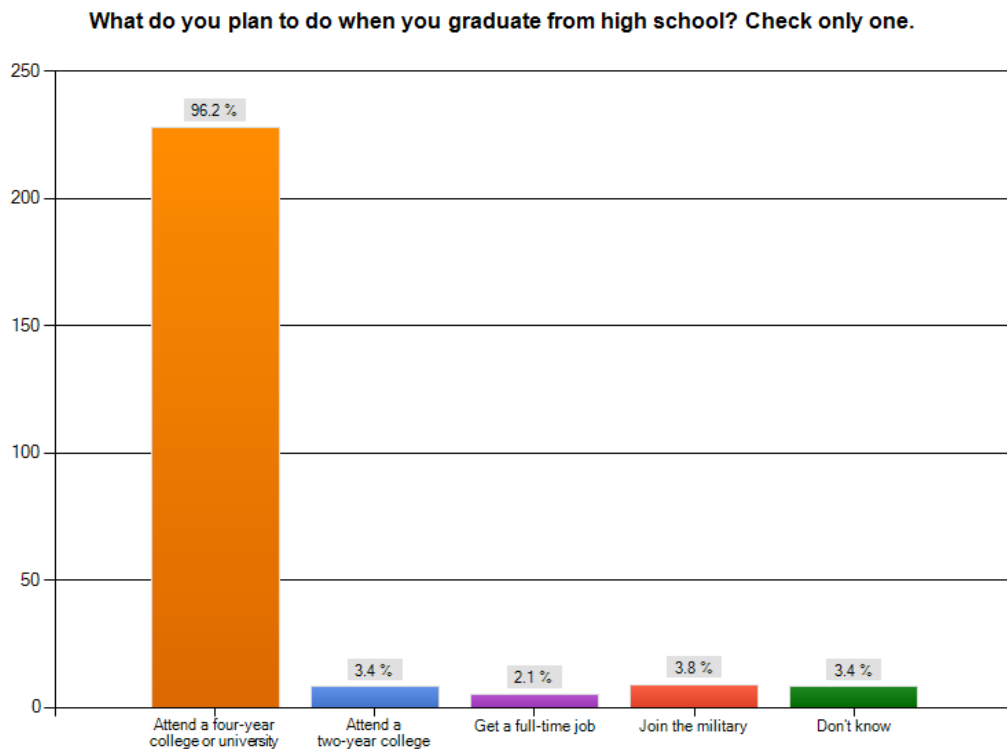
- Conducted comprehensive pre- and post-assessments of our largest program, TEAMS, in 2010. Initial findings from the students surveyed noted:  
 After participating in JETS, students reported an increased awareness and understanding of the engineering profession and an interest to pursue engineering majors and careers.
- Conducted the 5<sup>th</sup> annual NEDC competition with a focus on assistive technology devices which saw a 40% increase in school registrations from the previous year.
- Expanded partnership with the National Engineers Week Foundation (Eweek). Eweek will use the popular JETS' career resource, *Explore* magazine, as an official Eweek publication in 2010. In addition, JETS utilized its competition/program management expertise by serving as the interim Eweek Future City Competition Director for the 2009 finals competition.
- Four students from JETS TEAMS Competition of 2010 were selected to attend the first White House Science Fair.

## Student Data and Site Statistics

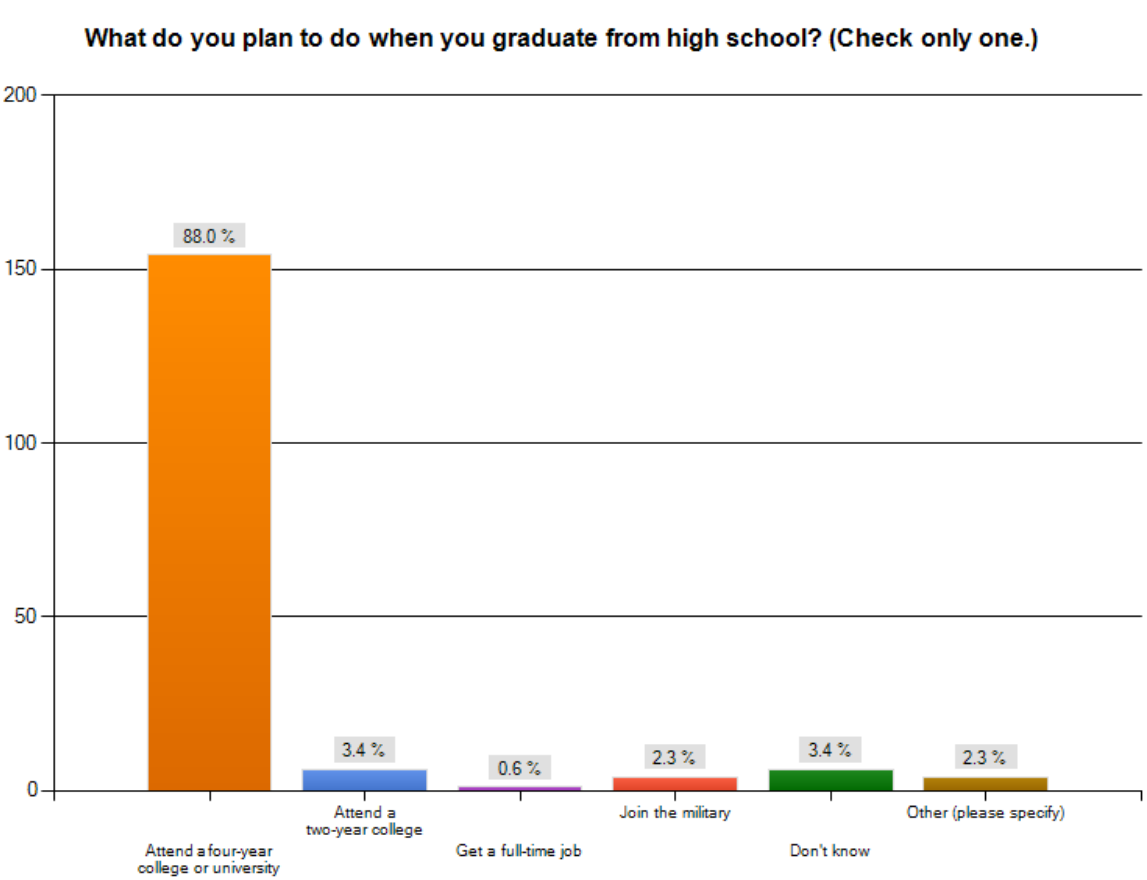
### Pre vs. Post Assessments Summary: UNITE 2010

One of the requirements of the UNITE program is for each site to administer a pre and post assessment to be completed by each student. The question below, “What do you plan to do when you graduate from high school?” shows that a majority of the UNITE students plan to pursue a four year degree after graduation. The post assessment shows that there was a slight decrease in this response. This is partly due to more students selecting the option, “other.” When reviewing these responses, each student noted that they wanted to obtain a degree that required more than four years of education, such as a Ph.D. or a master’s degree.

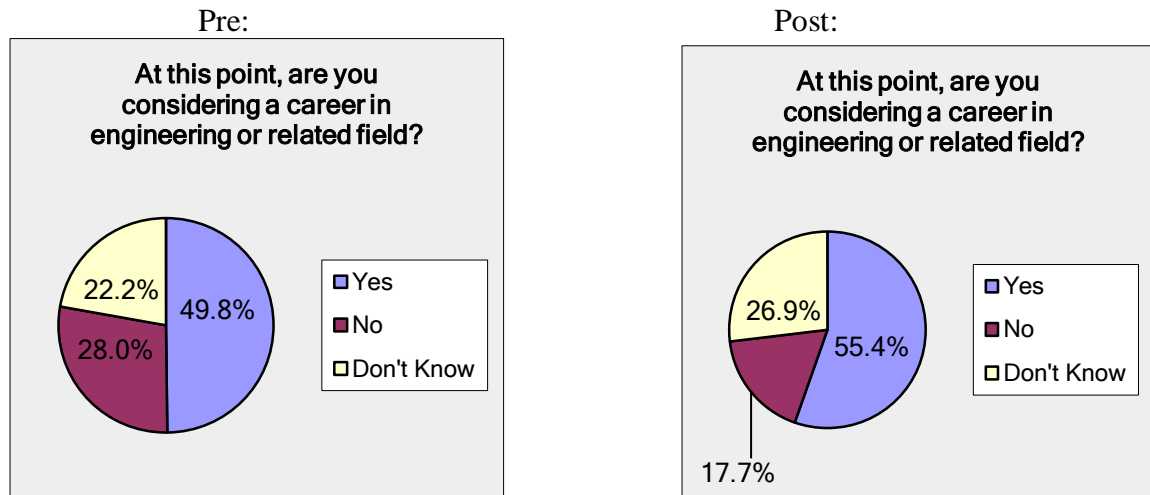
Pre:



Post:



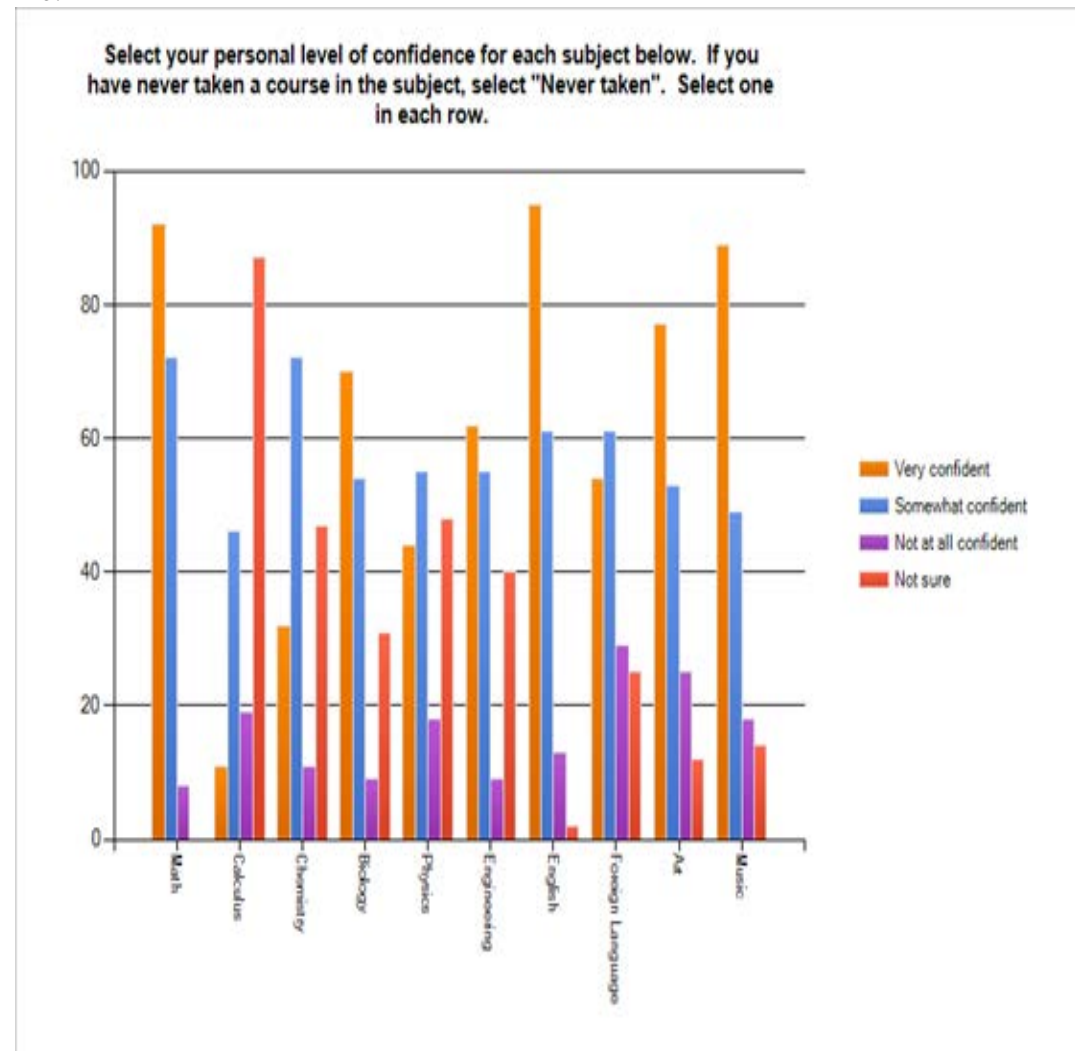
The next question, “At this point, are you considering a career in engineering or a related field?” shows an increase of students planning to pursue engineering as a career choice. The percentage of those students indicating they will pursue the field increased from 49.8% to 55.4%; those answering no to this question decreased from 28% to 17.7%.



The next question contained a variety of school subjects and assessed the student's confidence level in each of them. When looking at the fields that are directly related to engineering: calculus, physics, chemistry, biology, and engineering itself, each student's confidence level increased substantially in each subject. One exception to this being math, which remained stagnant. The following percentages illustrate the students' confidence level increase (i.e. selecting either “somewhat confident” or “very confident” in each subject).

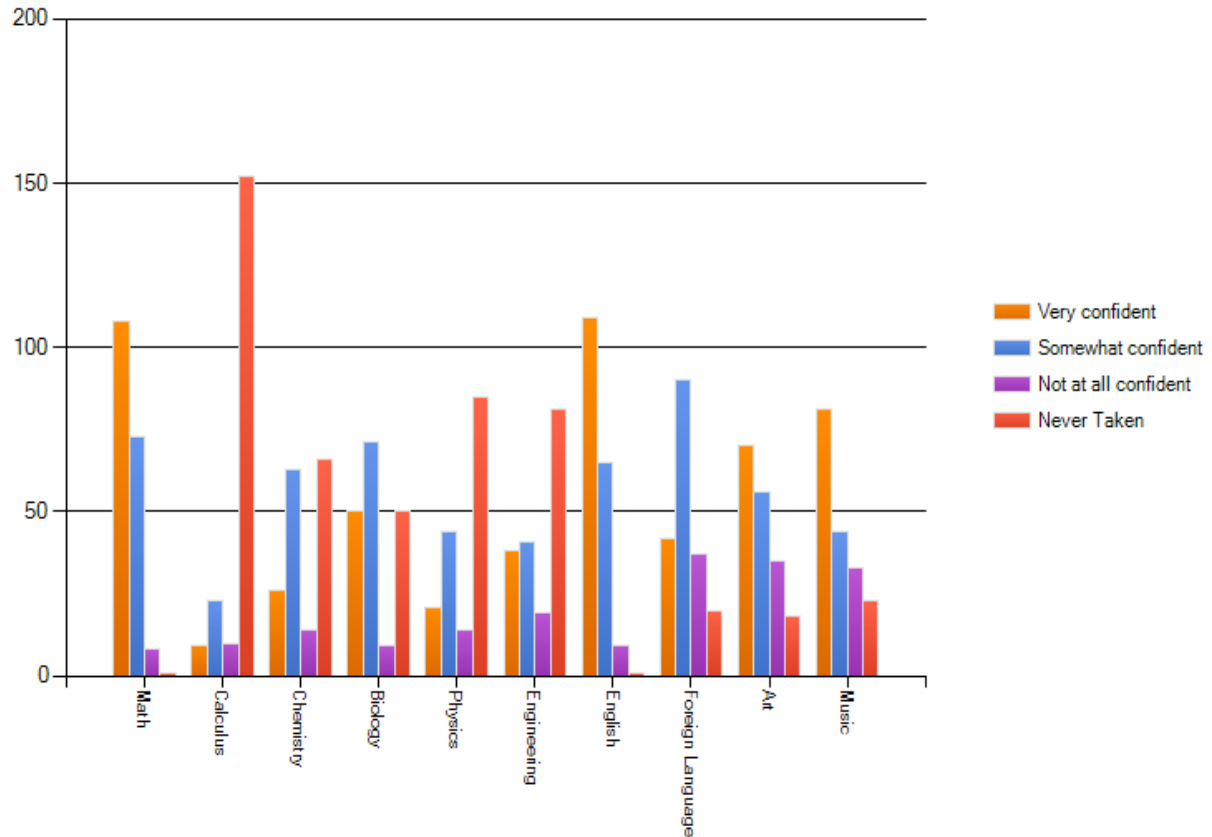
- Calculus: From 16% to 35%
- Physics: From 40% to 60%
- Engineering: From 43% to 70%
- Chemistry: 53% to 64%
- Biology: 67% to 76%

Pre:



Post:

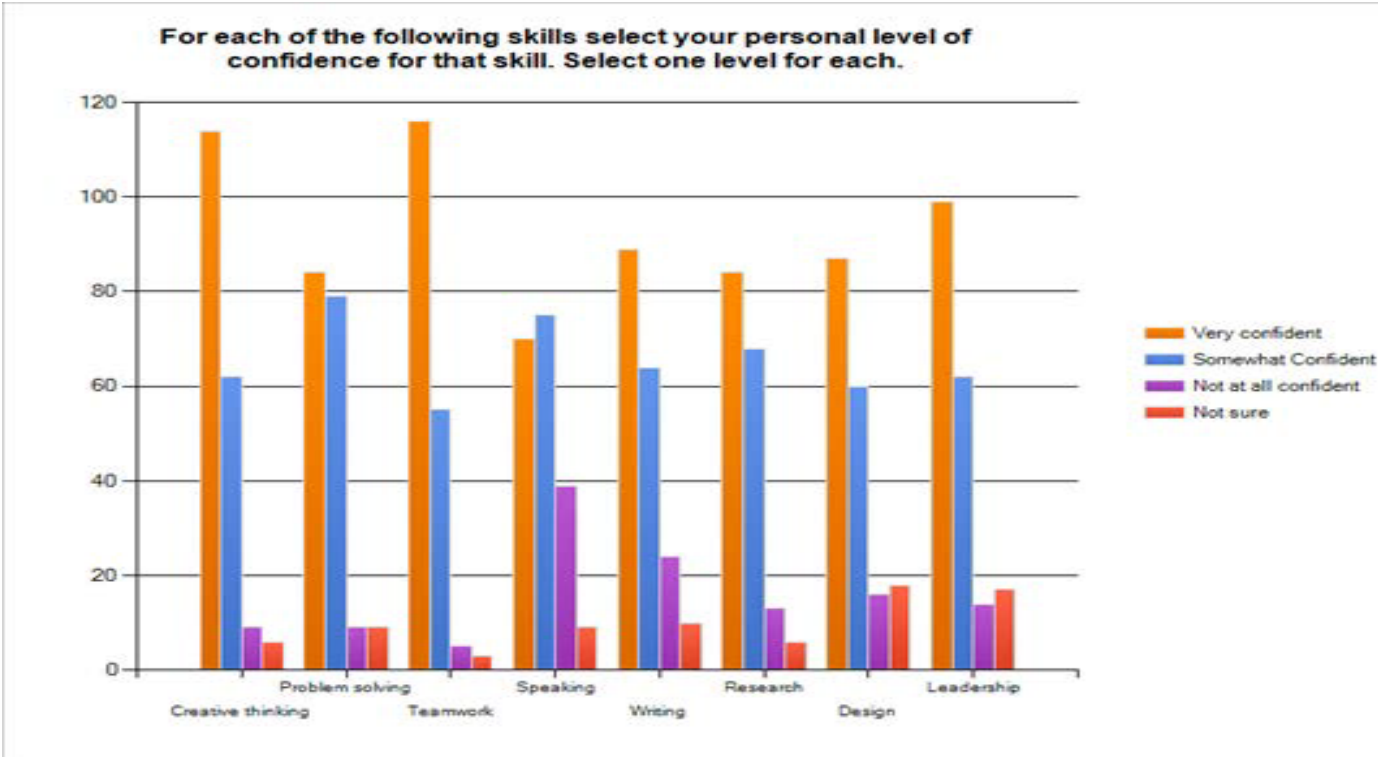
Select your personal level of confidence for each subject below. If you have never taken a course in the subject, select “Never taken”. Select one in each row.



The next assessment item listed personal skill sets and assessed the students' confidence level to each. The confidence level in each area showed an increase and the following percentages illustrate the students' confidence level increase (i.e. selecting either “somewhat confident” or “very confident” for each skill set).

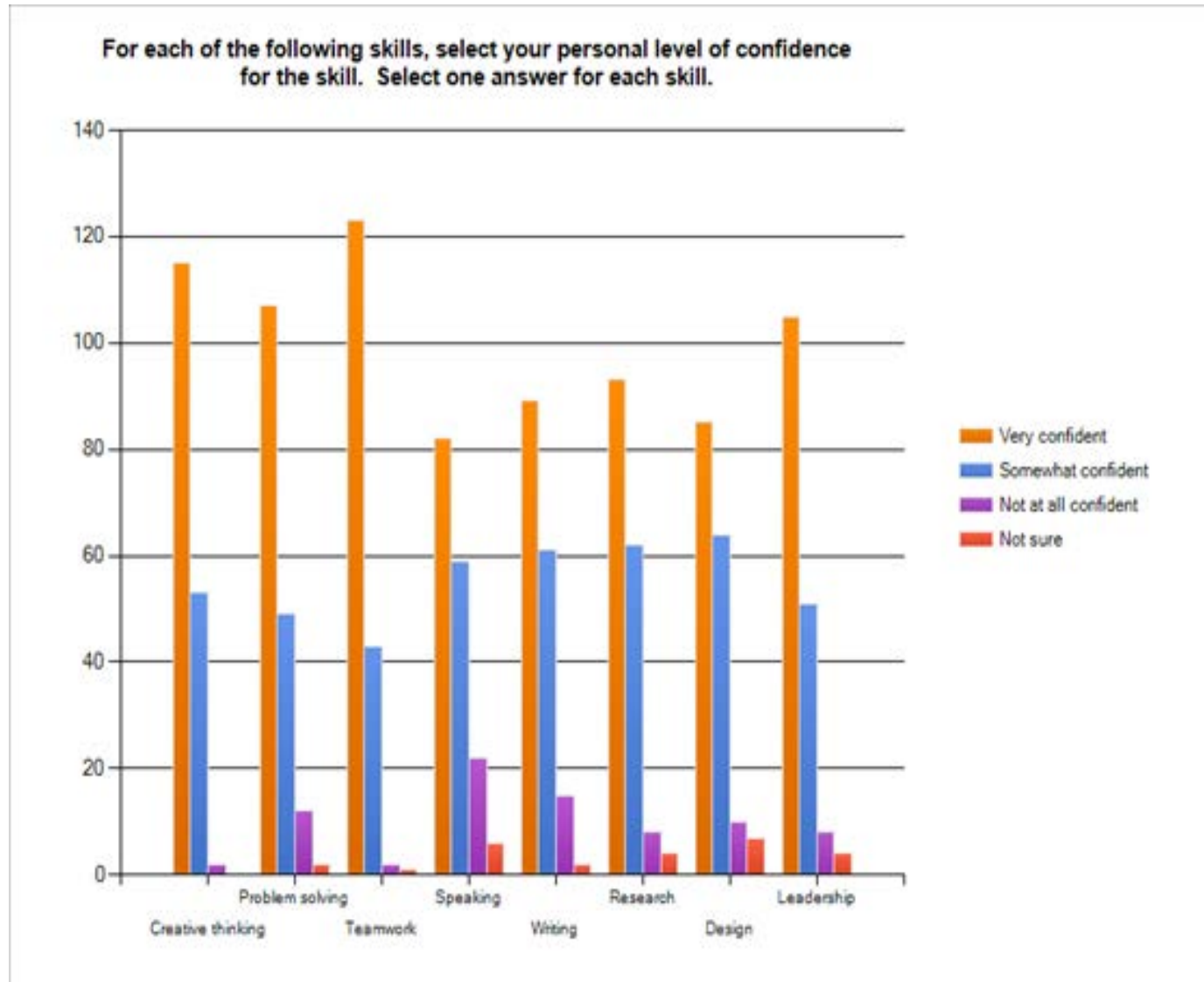
- Creative Thinking: From 92% to 99%
- Problem Solving: From 90% to 92%
- Teamwork: From 96% to 98%
- Speaking: 75% to 83%
- Writing: 82% to 90%
- Research: 89% to 93%
- Design: 81% to 90%
- Leadership: 84% to 93%

Pre:





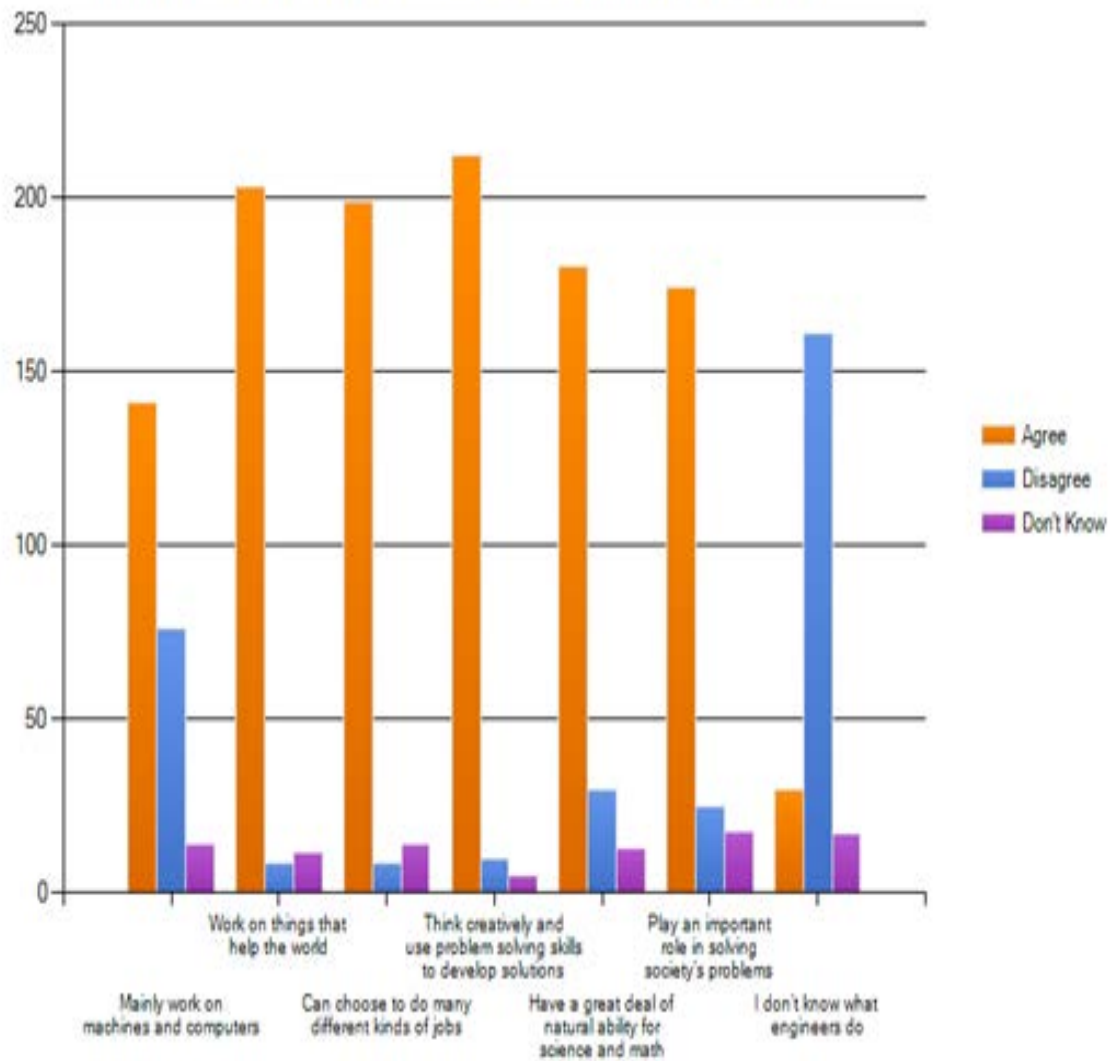
Post:



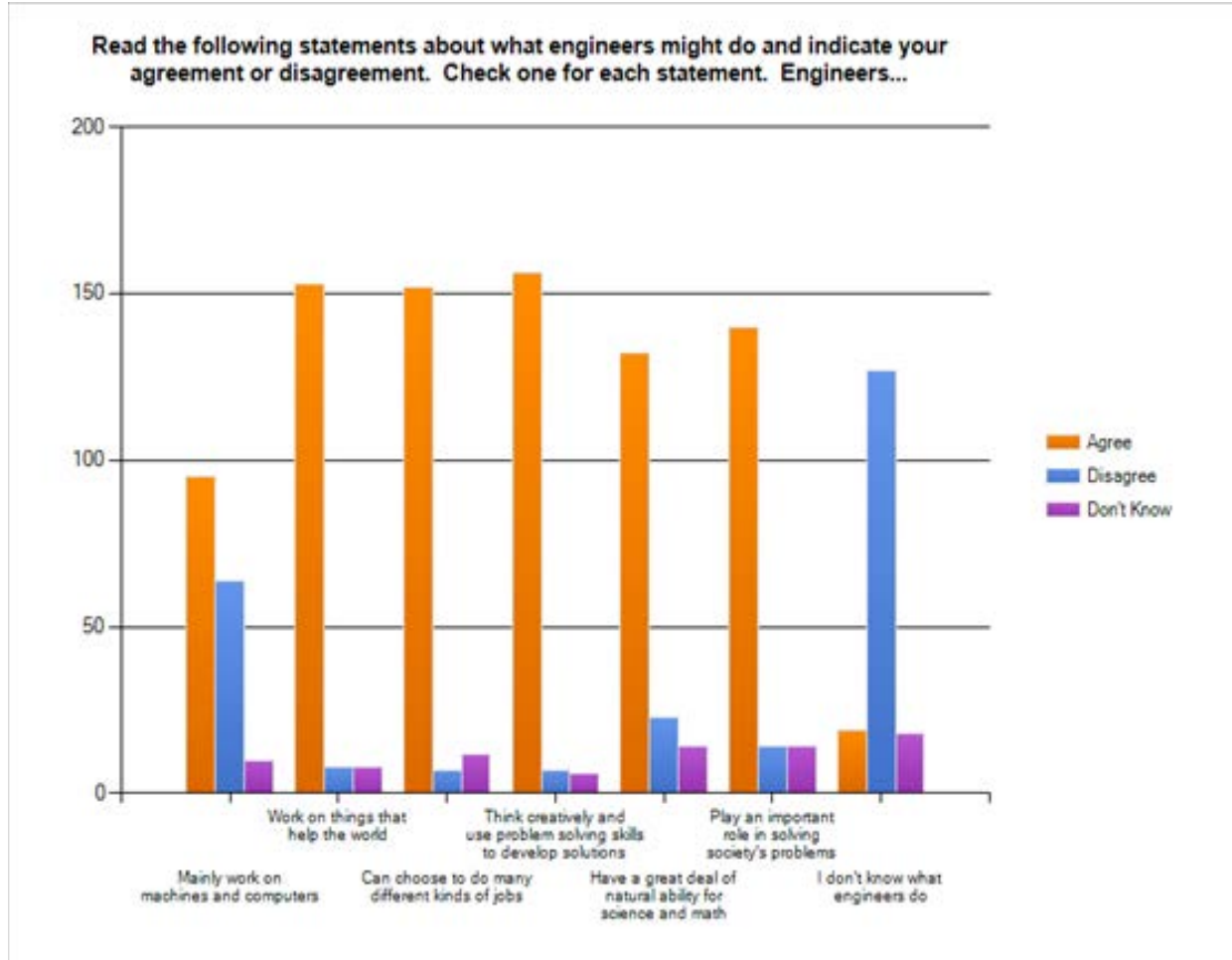
The following assessment below asked the students questions relating to an engineer's job. The graphs indicate an increase in the positive aspects of a job such as working on things that help the world and playing an important role in society being found in engineering. There was also a decrease in responses of not knowing what engineers do and that engineers mainly work on machines and computers.

Pre:

Read the following statements about what engineers might do and indicate your agreement or disagreement. Check one for each statement. Engineers....

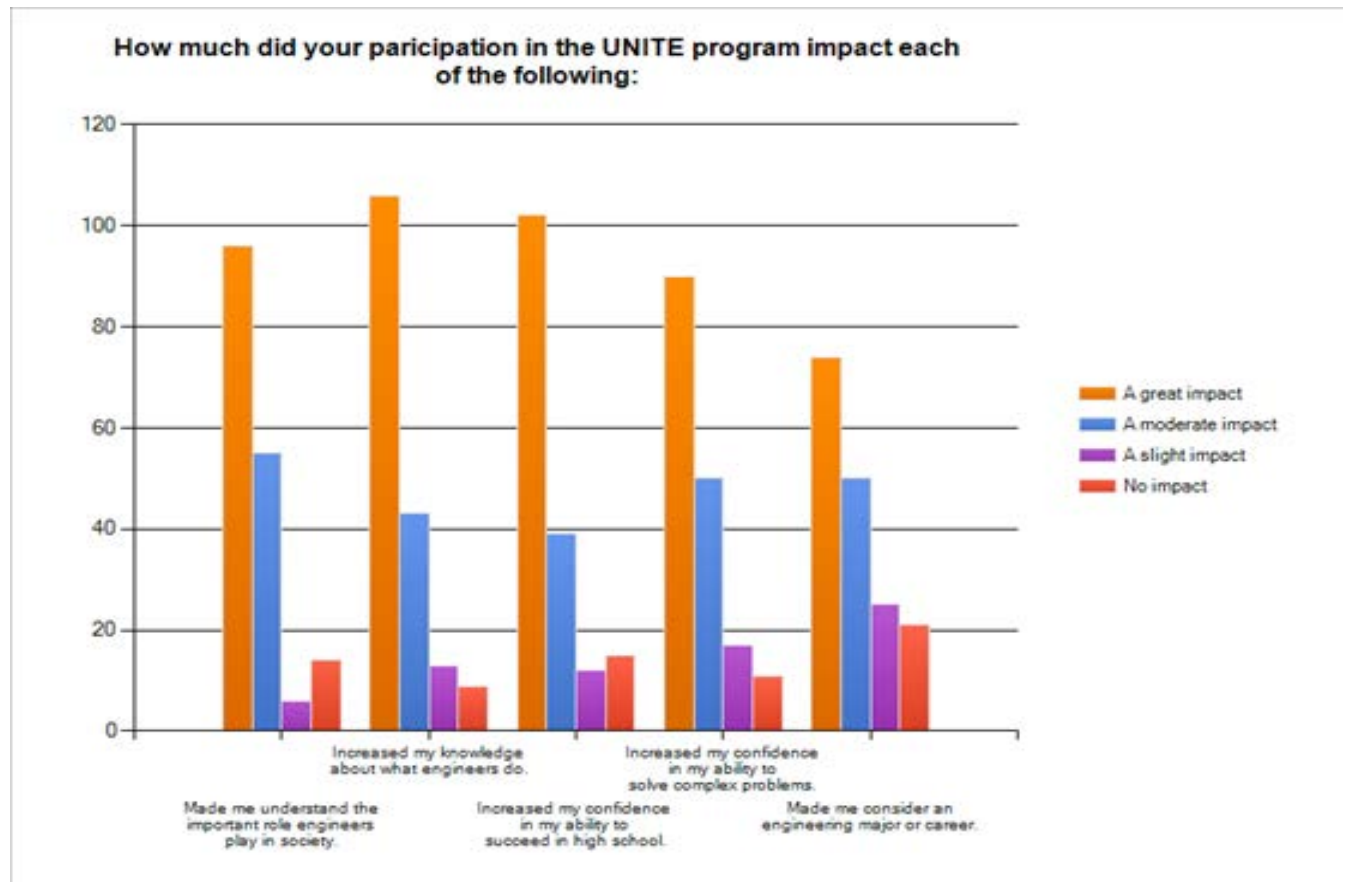


Post:



Finally, the last question asked the students to evaluate the impact of each of the questions below. The percentages appear to indicate that the UNITE program had a positive impact on the students. The following percentages show the amount of students impacted (slightly to greatly) due to the program.

- Understanding the important role engineers play in society: 92%
- Increased knowledge about what engineers due: 95%
- Increased in confidence in ability to succeed in engineering: 91%
- Increased confidence in ability to solve complex problems: 93%
- Made student consider engineering as a major or career: 88%



In summary, the pre and post assessments show the positive impact UNITE has had on the students. Not only were confidence levels increased in several academic areas but new skills were developed and an increased understanding about what engineers do was quite evident in these findings.